FACILITIES DESCRIPTIONS AND UPDATED COST ESTIMATES FOR MONTGOMERY RESERVOIR

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INTRODUCTION

The *Facility Descriptions and Updated Cost Estimates for Montgomery Reservoir* has been prepared as part of the Storage and Conveyance Component Refinement Task of the CALFED Bay-Delta Program (CALFED or Program). CALFED's mission is to develop a long-term comprehensive plan that will restore the ecological health and improve water management for beneficial uses of the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) system.

This report summarizes an evaluation of the principal features, estimated costs, and environmental considerations of constructing Montgomery Reservoir. This project would provide additional off-stream storage capacity in the San Joaquin Valley. This evaluation and others being performed by CALFED are intended to provide a facilities evaluation and updated cost estimates of representative storage and conveyance components. The objectives of the Montgomery Reservoir evaluation are (1) to provide an updated cost estimate which represents a cost within the range expected if the project were to be constructed today and (2) to enable CALFED to compare this project against other projects that might be considered as part of a long-term CALFED solution strategy.

The cost estimate for the Montgomery Reservoir project was determined from information presented in the Bureau of Reclamation (Reclamation) June 1961, *East Side Division Cost Estimate Appendix, Volume III,* and Reclamation's April 1993 response to the memorandum *Request for Cost Estimate for Montgomery Dam, Reservoir, and Associated Conveyance.*

A preliminary evaluation of the environmental considerations associated with this project has also been included in this report. Fish, wildlife, plant, and cultural resources that could be affected have been described and potential impacts have been identified. The information for the evaluation of environmental considerations was gathered from existing literature and databases.

PROJECT BACKGROUND

In the 1920s, it was recognized that water deficiency in the San Joaquin Valley would have to be overcome with transfers of surplus water from the northern streams to the drier areas of the San Joaquin Valley. Combined federal and State planning in the 1940s on the west side of the San

Joaquin Valley resulted in the joint federal-State San Luis Unit of the Central Valley Project (CVP) authorized in 1960. The project did not, however, address the need for additional water on the east side of the San Joaquin Valley, particularly those areas with the fewest opportunities to further develop additional supplies extending from the Merced River south to the Kern River. Thus, the East Side Division was created by Reclamation to develop water supply projects to meet the needs of the east side of the San Joaquin Valley.

In June 1966, Reclamation presented the *East Side Division, Initial Phase--Central Valley Project, California: A Report on the Feasibility of Water Supply Development.* The service area of the CVP East Side Division extends from the Mokelumne River in the north to the city of Bakersfield in the south. The proposed purpose of the East Side Division was to convey up to 1.5 million acre-feet of water from the Sacramento Valley to the east side of the San Joaquin Valley to meet the increasing water needs of this area. The primary conveyance facility was anticipated to be the East Side Canal, extending south from the Folsom South Canal at Littlejohns Creek to just north of Bakersfield. The East Side Canal was to have been operated in conjunction with existing CVP facilities and off-stream reservoirs to convey surface water from areas of surplus in the Sacramento Valley to areas of shortage along the east side of the San Joaquin Valley. Available CVP flows would be supplemented with unappropriated flows available in the Sacramento, American, and Stanislaus Rivers. Montgomery Reservoir was one of the off-stream reservoirs identified in the 1966 report which would have made this project feasible.

In the present analysis, Montgomery Reservoir is analyzed as a stand-alone facility that would be used to store and reregulate available storage from Lake McClure and/or surplus flows on the Merced River. Stored water could be used to meet local water needs previously met with releases from Lake McClure. The water retained in Lake McClure could be released to extend existing local water supplies, provide increased operational flexibility, or for other water users including environmental uses on the San Joaquin River and in the Delta.

FACILITIES DESCRIPTION

This section provides an overview of the major features included in the Montgomery Reservoir project. The principal reference used for this synopsis is Reclamation's June 1966 report *East Side Division, Initial Phase--Central Valley Project, California: A Report on the Feasibility of Water Supply Development.* Cost estimates are based on the June 1961 Reclamation report *East*

Side Division Cost Estimate, Appendix, Volume III, and Reclamation's 1993 response to the memorandum *Request for Cost Estimate for Montgomery Dam, Reservoir, and Associated Conveyance.*

PROJECT LOCATION

The Montgomery Reservoir project would be located in northeastern Merced County about 60 miles southeast of the Sacramento-San Joaquin Delta (see Figure 1). The dam site is located on Dry Creek about 16 miles above the confluence with the Merced River near the town of Snelling.

The dam site is located on the eastern edge of the Great Valley geomorphic province in an area covered by semiconsolidated and unconsolidated Pleistocene and Pliocene sediments. The consolidated sediments of the Pliocene Mehrten Formation underlie these deposits. The base of the dam would be founded to the Mehrten Formation.

The dam site is within the service area of Merced Irrigation District (MID), which supplies about 570,000 acre-feet of water per year for municipal and agricultural uses through its operation of New Exchequer Dam.

PROJECT DESCRIPTION

The Montgomery Reservoir project presented in this evaluation has been developed to provide off-stream storage of spills on the Merced River and provide flood control on Dry Creek. The project would consist of an off-stream storage reservoir, a pumping plant, a two-way conveyance canal, and a discharge pipeline (see Figure 2). The project would store available excess flows diverted from the Merced River at the Merced Falls Diversion Dam. Water diverted would be conveyed by gravity to Montgomery Reservoir through an expanded North Side Canal, an existing gravity distribution canal that serves the portion of MID north of the Merced River. The North Side Canal would be modified from a one-way canal to a two-way canal to facilitate movement of water to and from Montgomery Reservoir.

Surplus flows from the Merced River stored in the Montgomery Reservoir would be used to meet local water needs, allowing water retained in Lake McClure to be used for other uses. The water

stored in Montgomery Reservoir would not be returned to the Merced River. The water would be discharged via the pumping plant located at the base of the new embankment dam and pumped through a new discharge pipeline to the expanded North Side Canal. Some water placed in the canal would flow west by gravity to meet the needs of MID water users downstream of the turnout. Additional water placed in the canal would flow upstream from the pumping plant (east) in the North Side Canal. This water would be utilized to meet the needs of MID customers located along the expanded North Side Canal between the Merced Falls Diversion Dam and Montgomery Reservoir.

Some of the water placed in the North Side Canal would be conveyed through the new Main Canal pipeline to the MID Main Canal downstream of Snelling Dam. This water would be used to meet MID demands south of the Merced River. The primary purpose of the Montgomery Reservoir project would be to extend existing local water supplies and/or to provide additional operational flexibility for environmental water uses.

D R A F T

EXISTING FACILITIES

The Montgomery Reservoir is located about 10 miles west of New Exchequer Dam. New Exchequer Dam, which is owned and operated by MID, is located on the Merced River and impounds Lake McClure (see Figure 2). About eight miles downstream of New Exchequer Dam is McSwain Dam, also owned and operated by MID. Merced Falls Diversion Dam, located roughly one mile downstream of McSwain Dam, is used by MID to divert water into the North Side Canal. Snelling Dam is located about three miles downstream of Merced Falls Diversion Dam and is used by MID to divert water into the Main Canal, which serves areas south of the Merced River.

PRINCIPAL FACILITIES

This section provides details on the Montgomery Reservoir facilities. The Montgomery Reservoir project would include a new embankment dam, pumping plant, and a new discharge pipeline (see Figure 2). The project would also require the expansion of an existing conveyance canal. Table 1 presents information regarding the physical characteristics of this alternative.

Montgomery Dam and Reservoir

Montgomery Reservoir would be formed by constructing a zoned earthfill dam with a volume of about 4.6 million cubic yards to a total height of 101 feet above the original streambed. The crest of the dam would be 30.0 feet wide at an elevation of 336 feet above mean sea level (MSL). At maximum conservation pool, the reservoir would have a water surface elevation of 325 feet above MSL and a surface area of approximately 8,050 acres. Figure 3 presents the area-capacity curves for Montgomery Reservoir. For the feasibility-level investigations performed by Reclamation in 1961, embankment slopes of 3:1 on the upstream side and 2:1 on the downstream side were used; these side slopes have been adopted for this evaluation. Figure 4 shows a schematic representation of the proposed Montgomery Reservoir and its related facilities.

Saddle Dams

The 1961 Reclamation feasibility-level design include eight saddle dams of various lengths. Details regarding the height and embankment volumes of these dams were not included in the feasibility report. Based on engineering judgment, it was assumed for this report that the total embankment volume for the saddle dams totals about 20 percent of the embankment volume of the principal dam.

Spillway

A dam spillway capacity curve provided in the 1961 Reclamation report showed a maximum spillway capacity of about 1,000 cfs. That spillway was a glory hole located on the left side of the embankment dam which would drain into an unnamed tributary of Dry Creek. The spillway would have an inlet elevation of 329 feet above MSL and an outlet elevation of 310 feet above MSL.

Outlet Works

An outlet works capacity curve provided in the 1961 Reclamation report showed a maximum outlet capacity of 5,200 cfs at an elevation of 237 feet above MSL. The outlet works would be located near the center of the dam and would release water to Dry Creek.

Emergency Release Capacity

The California Department of Water Resources (DWR), Division of Safety of Dams requires that during emergency evacuation, 10 percent of the maximum water depth must be released in ten days. For Montgomery Dam, the emergency evacuation would be approximately 3,650 cfs, well within the 5,200 cfs design capacity of the proposed outlet works.

Pumping Plant

A single pumping plant, with a total capacity of 1,000 cfs, would be required on the discharge pipeline at Montgomery Reservoir to pump water from the reservoir to the North Side Canal.

Conveyance Facilities

To deliver water to the Montgomery Reservoir, the existing North Side Canal would be expanded from a one-way gravity canal to a two-way canal with a capacity of 2,000 cfs. The total length of this expansion would be about 30,000 feet from the Merced Falls Diversion Dam to the outlet at Montgomery Reservoir.

A new 15,000-foot-long discharge pipeline with a capacity of 1,000 cfs would be constructed from the pumping plant at the base of the embankment dam to the North Side Canal (see Figure 2). This discharge pipeline would deliver water from the Montgomery Reservoir back to the North Side Canal. Water delivered to the North Side Canal would flow in either direction from the connection point with the pipeline.

The Main Canal pipeline would connect the North Side Canal with the Main Canal. This pipeline would be approximately 4,000 feet long, crossing beneath the Merced River. This pipeline would facilitate delivering Montgomery Reservoir water to MID water users south of the Merced River. Deliveries from Montgomery Reservoir would reduce diversions from the Merced River to the Main Canal at Snelling Diversion Dam.

Relocations, Roads, and Utilities

Two of the larger relocation projects required to construct Montgomery Reservoir include the relocation of County Road 59J and a telephone line. An additional 4.5 miles of roads would have to be relocated for the inundated portions of Olsen Road and Fields Road.

COST ESTIMATE

The cost estimate for the facilities described above are based on previous estimates performed by Reclamation and DWR. The previous estimates have been reviewed and adopted for the present cost estimate update. Only items included in the previous estimates are included in the present cost estimate. This cost estimate does not include estimated costs of preparing environmental documentation and mitigation, operations and maintenance, power, reservoir filling, and interest during construction.

COST ESTIMATE METHODOLOGY

The cost estimate for Montgomery Reservoir was determined by escalating the costs in the Reclamation June 1961 report and the April 1993 memorandum to October 1996 dollars using Reclamation's Construction Cost Trends (CCT) indices. Table 2 provides the detailed breakdown of the estimated costs of Montgomery Reservoir. This table includes an updated cost estimate for cost items identified in the previous cost estimates along with the quantities of the cost item or an indication that the estimated cost has been developed through a lump sum approach. The table also includes the CCT index for the month and year in which the estimated costs were developed and for October 1996. In some instances, only a unit cost has been provided with no cost indices. In these cases, the unit cost has been taken from other sources. The far right-hand column of Table 2 provides the cost references for each item.

Right-of-Way Costs

Right-of-way costs of $2,500 per acre were based on land use costs developed by Reclamation's Land Resource Branch (February 1997). Reclamation provided these cost estimates at a subappraisal level for all the storage and conveyance components reviewed by CALFED. The total project lands to be acquired would include a buffer around the maximum water surface area.

The ratio of total project land required for the reservoir to maximum water surface area is 1:32, based on data from the *Los Banos Grandes Facility Feasibility Report, Appendix A: Design and Cost Estimate* (DWR, September 1990).

Pumping Plant Cost

The pumping plant cost estimate is based on actual construction costs for the Waddell Pumping-Generating Plant in Arizona, which was completed in 1994 and is similar in size and scope to the Montgomery Reservoir pumping plant. To estimate the cost for the Montgomery Reservoir pumping plant, the actual construction cost of the Waddell Pumping-Generating Plant (escalated to October 1996 dollars) was factored by the following empirical equation:

$$\frac{(Cost)_1}{(Cost)_2} = \frac{HP_1^{6/10}}{HP_2^{6/10}}$$

where HP is equal to horsepower.

This formula is valid over moderate ranges in horsepower; the validity over larger ranges is undetermined. The impact of any error resulting from utilizing this ratio beyond its valid range is expected to be within the range of the accuracy of the estimate.

Contingencies and Other Costs

All contingencies and engineering, construction management, and administrative factors were determined by historical engineering judgment based on similar level of cost estimation. Contingencies were chosen to be 20 percent, and engineering, construction management, and administration were chosen to be 35 percent. A cost range was developed for the project by subtracting 10 percent from the estimated capital cost for the low end cost and adding 15 percent to the estimated capital cost for the high end cost.

Preliminary Cost Findings

Costs of constructing the Montgomery Reservoir and its supporting facilities have been updated to an October 1996 basis as described above. The total estimated capital cost of the Montgomery

Reservoir project is estimated to range from $239 to $306 million dollars. The land and right-of-way costs total about $26.6 million; the new embankment dam costs about $31.1 million. The conveyance facilities and pump station total $39.5 million and $40.1 million, respectively.

ENVIRONMENTAL CONSIDERATIONS

This portion of the report provides a summary of environmental considerations related to the proposal for developing the Montgomery Reservoir. Fish, wildlife, plant, and cultural resources that could be affected are described and the extent of the impacts is identified. For the most part, the information presented in this section was gathered from existing literature, with limited original research. No field work was conducted for this analysis.

WILDLIFE

Depending on the reservoir configuration selected, the project could inundate up to 8,100 acres of terrestrial wildlife habitat.

Fish, Amphibians, Reptiles, and Invertebrates

Fish species supported by the intermittent streams and creeks within the Montgomery Reservoir area include hitch, California roach, hardhead, and Sacramento squawfish.

Several species of common amphibians and reptiles may occur in the project area. Common species that may be observed include bullfrog, Pacific tree frog, California toad, western fence lizard, side-blotched lizard, Pacific gopher snake, coast and aquatic gopher snake, and Pacific rattlesnake.

General Wildlife

Lands within the Montgomery Reservoir area support diverse wildlife. Common mammals that may be found in the area include cottontail, hare, squirrel, gopher, mouse, coyote, red fox, raccoon, weasel, badger, skunk, mountain lion, bobcat, and black-tailed mule deer. Few of these mammals would benefit from the reservoir. For most mammal species, the impact will be adverse as a result of loss of escape cover and breeding and foraging habitat.

Numerous bird species can be found using the Montgomery Reservoir area. Some of the common birds that may be found in the area include starling, finch, blackbird, goldfinch, swallow, and sparrow. Game birds that may be found in the area include California quail, ring-necked pheasant, chuckar, wild turkey, and mourning dove.

Sensitive and Listed Fish and Wildlife Species

According to the California Department of Fish and Game's (CDFG) California Natural Diversity Data Base records (Version 8/96), there is one wildlife species that is federally listed, the vernal pool fairy shrimp. There are six fish or wildlife species that are either candidates for listing or species designated by CDFG as "species of special concern." These species are California tiger salamander (federal candidate/CDFG species of special concern), San Joaquin pocket mouse (CDFG species of special concern), Merced kangaroo rat (federal candidate), hardhead (CDFG species of special concern), and tricolored blackbird (federal candidate/CDFG species of special concern).

Additional listed species that may potentially occur in the area of the Montgomery Reservoir or be indirectly affected by the reservoir include valley elderberry longhorn beetle (federal threatened), vernal pool tadpole shrimp (federal endangered), conservancy fairy shrimp (federal endangered), delta smelt (federal threatened), giant garter snake (federal threatened\State endangered), bald eagle (federal threatened\State endangered), Aleutian Canada goose (federal threatened), American peregrine falcon (federal endangered), and the San Joaquin kit fox (federal endangered/State threatened).

According to the U.S. Fish and Wildlife Service, it is also possible that several other sensitive species proposed for federal listing may be affected directly or indirectly (mostly in the Bay-Delta) including California red-legged frog, Sacramento splittail, spotted bat, Yuma myotis, small-footed myotis, greater western mastiff bat, long-eared myotis bat, fringed myotis bat, long-legged myotis bat, Pacific western big-eared bat, Bell's sage sparrow, western burrowing owl, ferruginous hawk, mountain plover, little willow flycatcher, white-faced ibis, silvery legless lizard, northwestern pond turtle, southwestern pond turtle, California horned lizard, western spadefoot toad, green sturgeon, river lamprey, Kern brook lamprey, Pacific lamprey, longfin smelt, and Merced Canyon shoulderband snail.

VEGETATION

Vegetation at the Montgomery Reservoir site consists primarily of annual grasslands.

Sensitive and Listed Plant Species and Communities

Federal or State-listed plant species known to occur in the Montgomery Reservoir project area include succulent owls' clover (federal proposed threatened\State endangered, Colusa grass (federal proposed threatened\State endangered), and Hartwig's golden sunburst (federal proposed endangered\State endangered). An additional federal proposed threatened plant species, Hoover's spurge, may occur in the Montgomery Reservoir project area.

Dwarf downingia and Henderson's bent grass, listed by the California Native Plant Society as being rare, threatened, or endangered in California and elsewhere, could also be affected by the proposed Montgomery Reservoir project.

Wetlands

Many of the creeks and drainages in the Montgomery Reservoir area have one or more areas that support stands of cattails and tules. These wet areas occur both naturally along the creek bed and artificially in areas where impoundments have been constructed across the creek. The project area contains the following types of wetlands: emergent wet meadows, emergent shallow marshes, emergent deep marshes, scrub-shrub wetlands, ten lower perennial stream wetlands, two upper perennial stream wetlands, 18 intermittent streambeds, and numerous farm ponds.

One special-status wetland habitat, northern claypan vernal pool, can be found in the area of the proposed project. Northern claypan vernal pools are distributed on lower terraces and basin rims (toward the valley trough) of the central San Joaquin Valley north to Glenn and Colusa Counties. The pools are fairly old and may be small or large and circum-neutral to alkaline, with silicon cemented hardpan soils.

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CULTURAL RESOURCES

Information regarding the extent of cultural resources within the area that would be directly affected by the Montgomery Reservoir was not researched for this report.

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U.S. Fish and Wildlife Service, September 1995, *Environmental Effects of Yield Increase Options, Technical Appendix #9 to the Final Least-Cost CVP Yield Increase Plan.*

U.S. Fish and Wildlife Service, National Wetlands Inventory Program.

U.S. Geological Survey, National Aerial Photography Program.

U.S. Geological Survey Topographic Maps: Winton; Yosemite Lake; and Snelling.

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Table 1
SUMMARY OF PHYSICAL CHARACTERISTICS
MONTGOMERY RESERVOIR

Reservoir	
Maximum Pool Elevation (feet above MSL)	325
Capacity at Maximum Elevation (acre-feet)	240,000
Inundation Area (acres)	8,050
Main Dam	
Type	Earthfill
Height above Streambed (feet)	101
Crest Length (feet)	11,300
Top of Dam (feet above MSL)	336
Downstream Face Slope (horizontal on vertical)	2:1
Upstream Face Slope (horizontal on vertical)	3:1
Embankment Volume (million cubic yards)	4.6
Outlet Works	
Capacity (cfs) @ Water Surface Elevation of 320 feet	5,200
Invert Elevation (feet above MSL)	237
Spillway	
Capacity (cfs)	1,000
Invert Elevation (feet above MSL)	329
Pumping Plant	
Static Head (feet)	85
Capacity (cfs)	1,000
Saddle Dams	
Number Required	8

Table 2
ESTIMATED COSTS
MONTGOMERY RESERVOIR

DESCRIPTION	QUANTITY	UNIT*	USBR INDEX JUL. 60	USBR INDEX OCT. 96	UNIT COST JUL. 60	UNIT COST OCT. 96	TOTAL COST OCT. 96	COST REFERENCE
I. LAND AND RIGHTS								
Reservoir Rights-of-Way (8,050 Ac x 1.32 Buffer Factor)	10,626	AC				$2,500	$26,565,000	1
SUBTOTAL LAND AND RIGHTS							$26,565,000	
II. RELOCATION OF EXISTING PROPERTY								
County Road Relocation	JOB	LS	41	161	$644,000	$2,528,878	$2,528,878	2, sheet 5
Relocate Telephone Line	8	MI	39	234	$6,000	$36,000	$288,000	2, sheet 5
Additional Roads	5	MI				$36,000	$162,000	
SUBTOTAL RELOCATION OF EXISTING PROPERTY							$2,978,878	
III. CLEARING LANDS								
Reservoir Clearing	8,050	AC				$1,097	$8,830,850	3, item IV-a
SUBTOTAL CLEARING LANDS							$8,830,850	
IV. DAM AND DIKES								
Mongomery Dam								
Diversion of Water and Unwatering Foundations	JOB	LS	43	159	$20,000	$73,953	$73,953	2, sheet 6
Excavation for Dam Foundation	1,100,000	CY				$3.23	$3,553,000	3, item I-d
Excavation, Stripping Borrow Pits	150,000	CY				$1.15	$172,500	3, item I-c
Excavation, Earthfill, in Borrow Pits and Haul to Dam	2,800,000	CY	43	159	$0.65	$2.40	$6,729,767	2, sheet 6
Excavation, Misc Fill, in Borrow Pits and Haul to Dam	180,000	CY	43	159	$0.50	$1.85	$332,791	2, sheet 6
Excav., Sand and Gravel, in Borrow Pits and Haul to Dam	1,000,000	CY	43	159	$0.70	$2.59	$2,588,372	2, sheet 6
Earthfill	2,400,000	CY	43	159	$0.16	$0.59	$1,419,907	2, sheet 6
Miscellaneous Fill	980,000	CY	43	159	$0.15	$0.55	$543,558	2, sheet 6
Sand and Gravel Fill	910,000	CY	43	159	$0.14	$0.52	$471,084	2, sheet 6
Furnish and Place Riprap	180,000	CY				$31.64	$5,695,200	3, item I-n
Furnish and Place Rock Surfacing on Downstream Slope	86,000	CY	43	159	$2.00	$7.40	$636,000	2, sheet 6
Treatment to Correct Seepage	JOB	LS	43	159	$1,000,000	$3,697,674	$3,697,674	2, sheet 6

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Table 2
ESTIMATED COSTS
MONTGOMERY RESERVOIR

DESCRIPTION	QUANTITY	UNIT*	USBR INDEX JUL. 60	USBR INDEX OCT. 96	UNIT COST JUL. 60	UNIT COST OCT. 96	TOTAL COST OCT. 96	COST REFERENCE
Montgomery Dam Costs							$25,913,806	
Dikes (20%)	JOB	LS					$5,182,761	4
SUBTOTAL DAMS AND DIKES							$31,096,567	
V . SPILLWAY								
Excavation, All Classes, Open Cut	27,000	CY				$3.38	$91,260	3, item II-a
Furnish and Place Riprap	1,150	CY				$31.64	$36,386	3, item I-n
Special Compaction	570	CY	39	186	$3.50	$16.69	$9,515	2, sheet 7
Pervious Backfill Around Structures	5,150	CY				$8.17	$42,076	3, item III-f
Concrete in Inlet Structure	137	CY				$365	$50,038	3,avg II-h,III-c&d
Concrete in Conduit	208	CY				$366	$76,230	3, item II-d
Concrete in Chute and Stilling Basin	835	CY				$365	$304,975	3,avg II-h,III-c&d
Concrete in 12-inch Exit Channel Lining	255	CY				$80.00	$20,400	4
Concrete in 4-inch Canal Lining	205	CY				$80.00	$16,400	4
Rubber Waterstop, 6-inch	510	LF	39	186	$3.50	$16.69	$8,513	2, sheet 7
Chain-link Fence	350	LF	39	186	$4.00	$19.08	$6,677	2, sheet 7
Air Inlet Piping	1,100	LB	39	186	$0.50	$2.38	$2,623	2, sheet 7
SUBTOTAL SPILLWAY							$665,093	
VI. OUTLET WORKS								
Excavation, All Classes, Open Cut	286,000	CY				$6.76	$1,933,360	3, item VI-I
Furnish and Place Riprap	5,350	CY				$31.64	$169,274	3, item I-n
Pervious Backfill Around Structures	23,000	CY				$18.99	$436,770	3, item VI-h
Special Compaction	3,780	CY	39	186	$3.50	$16.69	$63,097	2, sheet 7
Concrete in Inlet Lining	600	CY				$321	$192,408	3, item VI-t
Concrete in Intake Structure	3,200	CY				$340	$1,086,400	3, item VI-k
Concrete in Upstream Conduit	2,730	CY				$321	$875,456	3, item VI-t
Concrete in Downstream Conduit	3,680	CY				$321	$1,180,102	3, item VI-t
Concrete in Access House	130	CY				$340	$44,135	3, item VI-k
Concrete in Anchor Blocks	4,600	CY				$256	$1,178,290	3, item VII-c
Concrete in Chute and Stilling Basin	3,100	CY				$365	$1,132,244	3,avg II-h,III-c&d

Table 2
ESTIMATED COSTS
MONTGOMERY RESERVOIR

DESCRIPTION	QUANTITY	UNIT[a]	USBR INDEX JUL. 60	USBR INDEX OCT. 96	UNIT COST JUL. 60	UNIT COST OCT. 96	TOTAL COST OCT. 96	COST REFERENCE
Concrete in Bridge Deck	123	CY				$424	$52,092	3, item VI-gg
Concrete in Bridge Piers	800	CY				$363	$290,008	3, item VI-ff
6-inch Soil Pipe Drain	980	LF	37	206	$4.20	$23.38	$22,916	2, sheet 7
Type "B" Rubber Waterstops	1,910	LF	39	186	$3.50	$16.69	$31,882	2, sheet 7
Trashracks	225,000	LB				$3.63	$816,750	3, item VI-q
Stop-log Seats and Guides at Intake Structure	22,000	LB				$3.63	$79,860	3, item VI-ii
Stop-logs at Intake Structure	50,000	LB	37	206	$0.23	$1.28	$64,027	2, sheet 8
17-ft by 22.5-ft Fixed Wheel Gate	124,000	LB	37	206	$0.70	$3.90	$483,265	2, sheet 8
Fixed Wheel Gate Frames and Guides	56,300	LB	37	206	$0.50	$2.78	$156,727	2, sheet 8
Fixed Wheel Gate Hoist	30,000	LB	37	206	$1.02	$5.68	$170,368	2, sheet 8
Fixed Wheel Gate Control	2,500	LB	37	206	$2.15	$11.97	$29,926	2, sheet 8
Miscellaneous Metalwork	2,000	LB				$3.63	$7,260	3, item VI-ii
Reservoir Level Gage, Floatwell, and Piping	8,000	LB	37	206	$1.00	$5.57	$44,541	2, sheet 8
Steel Girder Bridge Metalwork at Intake Structure	60,000	LB	37	206	$0.26	$1.45	$86,854	2, sheet 8
Chain-link Fence	1,220	LF	39	186	$4.00	$19.08	$23,274	2, sheet 8
17-ft Diameter Steel Pipe and Liner	945,000	LB	37	206	$0.35	$1.95	$1,841,473	2, sheet 8
9.5-ft Diameter Steel Outlet Pipes (2 Total)	115,000	LB	37	206	$0.30	$1.67	$192,081	2, sheet 8
7.5-ft by 9-ft Outlet Gates (4 Total)	440,000	LB	37	206	$0.57	$3.17	$1,396,346	2, sheet 8
Outlet Gate Controls	3,500	LB	37	206	$2.15	$11.97	$41,896	2, sheet 8
Stop-log Seats and Guides at Control Structure	6,000	LB	37	206	$0.37	$3.63	$21,780	3, item VI-ii
Stop-logs at Control Structure	14,000	LB	37	206	$0.23	$1.28	$17,928	2, sheet 8
Gravel Surfacing (4-inch)	400	CY	37	206	$4.00	$22.27	$8,908	2, sheet 8
SUBTOTAL OUTLET WORKS							$14,171,698	
VI. CONVEYANCE FACILITIES								
Reservoir Supply Pipeline	JOB	LS	202	222	$15,000,000	$16,485,149	$16,485,149	5, sheet 1
Pumping Plant	JOB	LS				$40,068,000	$40,068,000	4
Discharge Pipeline	JOB	LS	202	222	$16,000,000	$17,584,158	$17,584,158	5, sheet 1
Main Canal Pipeline	JOB	LS	202	222	$5,000,000	$5,495,050	$5,495,050	5, sheet 1
SUBTOTAL CONVEYANCE FACILITIES							$79,632,357	

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Table 2
ESTIMATED COSTS
MONTGOMERY RESERVOIR

DESCRIPTION	QUANTITY	UNIT[a]	USBR INDEX JUL. 60	USBR INDEX OCT. 96	UNIT COST JUL. 60	UNIT COST OCT. 96	TOTAL COST OCT. 96	COST REFERENCE
SUBTOTAL FOR MONTGOMERY RESERVOIR							$164,000,000	
CONTINGENCIES @ 20%							$32,800,000	
ESTIMATED CONSTRUCTION COST							$197,000,000	
ENG., LEGAL, AND ADMINISTRATIVE. @ 35%							$69,000,000	
ESTIMATED CAPITAL COST FOR MONTGOMERY RESERVOIR							$266,000,000	
ESTIMATED CAPITAL COST RANGE FOR MONTGOMERYRESERVOIR								
LOW (-10%)							$239,000,000	
HIGH (+25%)							$306,000,000	

Footnote:

[a]CY=cubic yard; LB=pound; LS=lump sum; LF=linear foot; MI=mile; AC=acre

Cost References:

1. U.S. Bureau of Reclamation, Land Resources Branch, Personal Communication, Graham McMullen, February 1997.
2. U. S. Bureau of Reclamation, East Side Division, *DC1 Cost Estimate Appendix, Vol. III,* June 1961
3. California Department of Water Resources, *Los Banos Grandes Facilities Report, Appendix A: Designs and Cost Estimates,* Table 4, December 1990.
4. Cost developed by Bookman-Edmonston Engineering.
5. U. S. Bureau of Reclamation, *Memorandum Requesting Cost Estimate for Montgomery Dam,* April 1993.

Table 3

SUMMARY OF ESTIMATED COSTS

MONTGOMERY RESERVOIR

Cost Item	Estimated Cost ($Million)
Land and Rights	26.6
Relocation of Existing Property	2.8
Clearing Lands	8.8
Dams and Dikes	31.1
Spillway	0.7
Outlet Works	14.2
Conveyance Facilities	39.5
Power Plant	40.1
SUBTOTAL	164.0
Contingencies (20%)	32.8
ESTIMATED CONSTRUCTION COST	197.0
Engineering, Legal, and Project Administration (35%)	69.0
ESTIMATED TOTAL CAPITAL COST	266.0
Capital Cost Range (minus 10% - plus 15%)	$239 - $306

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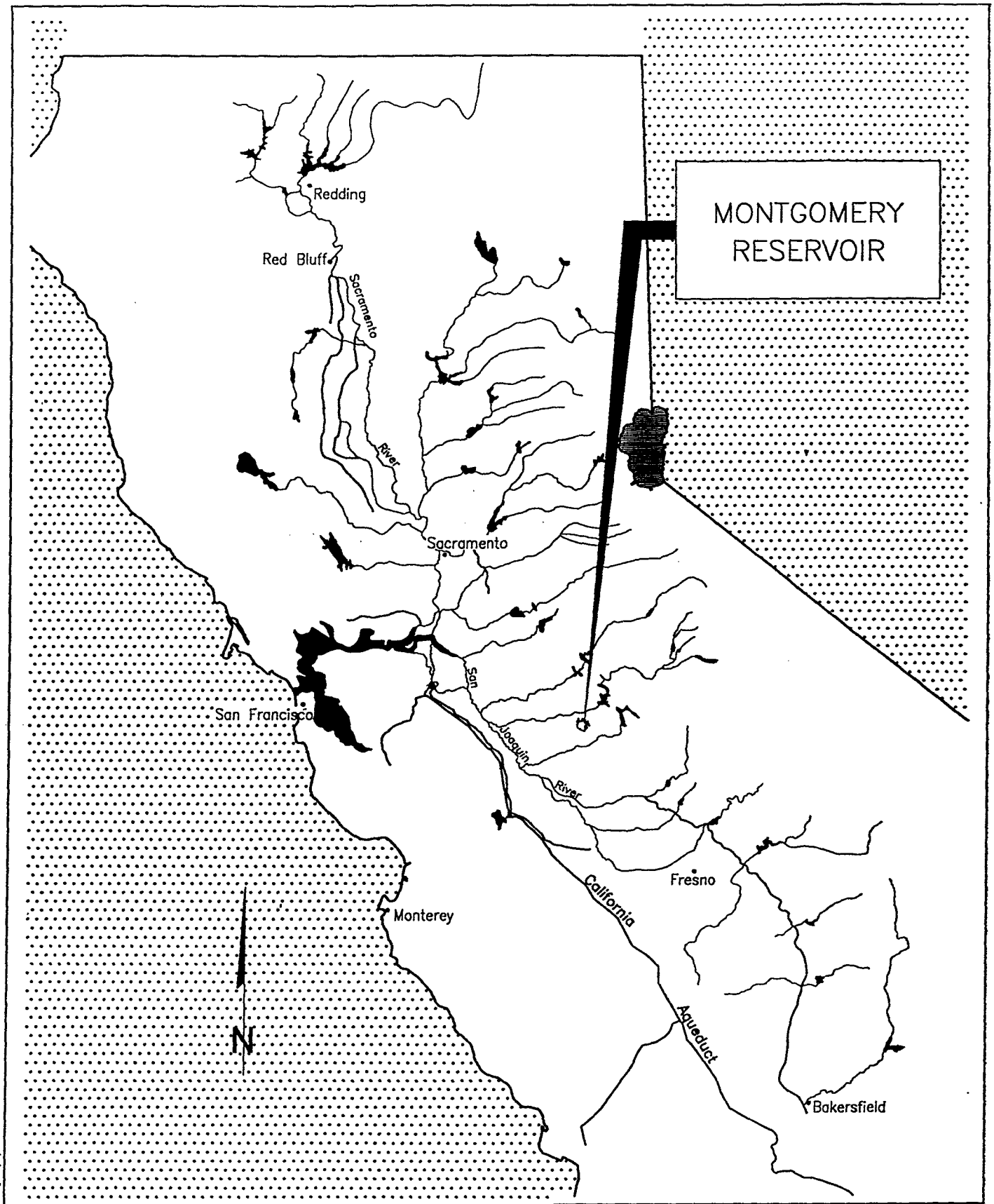

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Figure 1

Project Location Map
Montgomery Reservoir

CALFED BAY-DELTA PROGRAM

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LA GRANGE
2.8 MILES

STANISLAUS COUNTY
MERCED COUNTY

County

Road

MARIPOSA COUNTY
MERCED COUNTY

Olsen

Road

MONTGOMERY

RESERVOIR

Fields

Creek

Dry

Creek

Meyers

Creek

South

Fork

LAKE
McCLURE

NEW
EXCHEQUER
DAM

RIVER

PROPOSED
MONTGOMERY DAM

Dry

MONTGOMERY
PUMPING PLANT

Flamond Avenue

Keyes Road

KELSEY
RESERVOIR

Montgomery

St

SNELLING

DISCHARGE
PIPELINE TO
NORTH SIDE CANAL

NORTH SIDE
(Expanded 2-way Reservoir Supply Canal)

CANAL

MAIN CANAL
PIPELINE

McSWAIN
DAM

MERCED

Merced

Falls

Road

RIVER

SNELLING
DIVERSION
DAM

MERCED FALLS
DIVERSION
DAM

Merced Falls Road

HORNITOS
5.4 MILES

Snelling

Road

Allen Rd.

Robinson Rd

MAIN

CANAL

MERCED
16 MILES

N

0' 4000' 8000'

Project Location

REDDING
SACRAMENTO
SAN FRANCISCO
LOS ANGELES

VICINITY MAP

Figure 2
Montgomery Reservoir

LEGEND

- Existing Reservoir
- Proposed Montgomery Reservoir
- Existing Canals
- Proposed Conveyance Facilities
- Existing Roads and Highways
- Existing Waterways
- Proposed Dams
- Pumping Plant

CALFED BAY-DELTA PROGRAM

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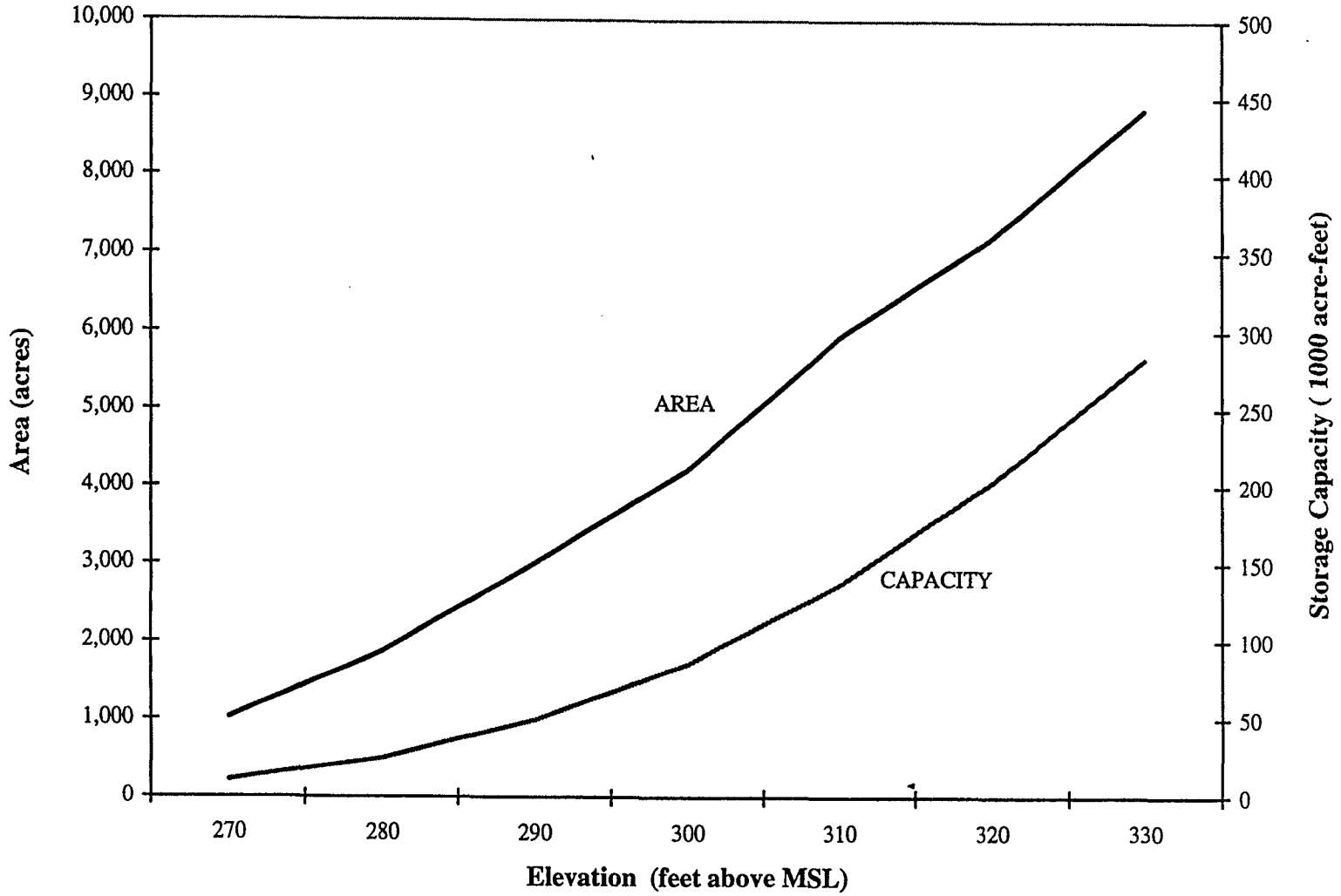
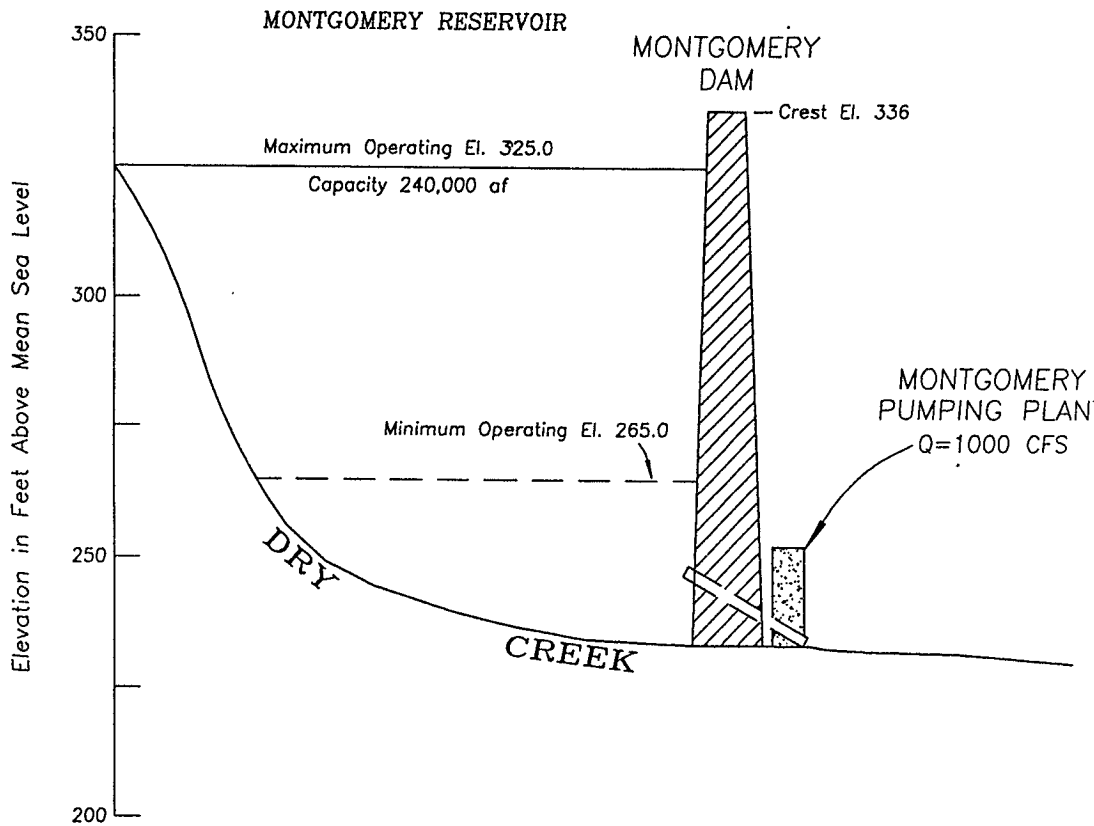
Figure 3
AREA-CAPACITY CURVES
MONTGOMERY RESERVOIR





NOTE:
THE MONTGOMERY PUMPING PLANT PUMPS WATER FROM MONTGOMERY RESERVOIR TO THE NORTH SIDE CANAL

Figure 4
Montgomery Reservoir
Schematic Profile

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